Evaluation of Suitable Juvenile Steelhead Trout Habitat in the Carmel River Lagoon

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INTRODUCTION

The Carmel River Lagoon provides key rearing habitat for the federally endangered juvenile steelhead (Oncorhynchus mykiss) prior to its migration into marine waters. Juvenile steelhead living in coastal lagoons have been found to have faster growth rates and larger size at ocean entry when compared to juveniles reared further upstream within the freshwater reaches (Hayes et al. 2008).

Several studies have attributed the success of lagoon-reared salmon to abundant food in the form of a diverse macroinvertebrate prey community and the longer duration spent in the transition zone where fish can adjust to increasing salinity prior to migrating out to sea (Hayes et al, 2008).

Additionally, there is a greater return rate of lagoon-reared steelhead: 95.5% of the returning adults in Scott Creek Lagoon in adjacent Santa Cruz County were lagoon-reared, though only 8 to 48% of the steelhead population smolt in the lagoon (Bond, 2006). However, if steelhead inhabiting Central Coast estuaries are to benefit from the lagoon environment, good water quality habitat (GWQH) must be manifest.

Figure 1. Location of five sampling sites in the Carmel River Lagoon

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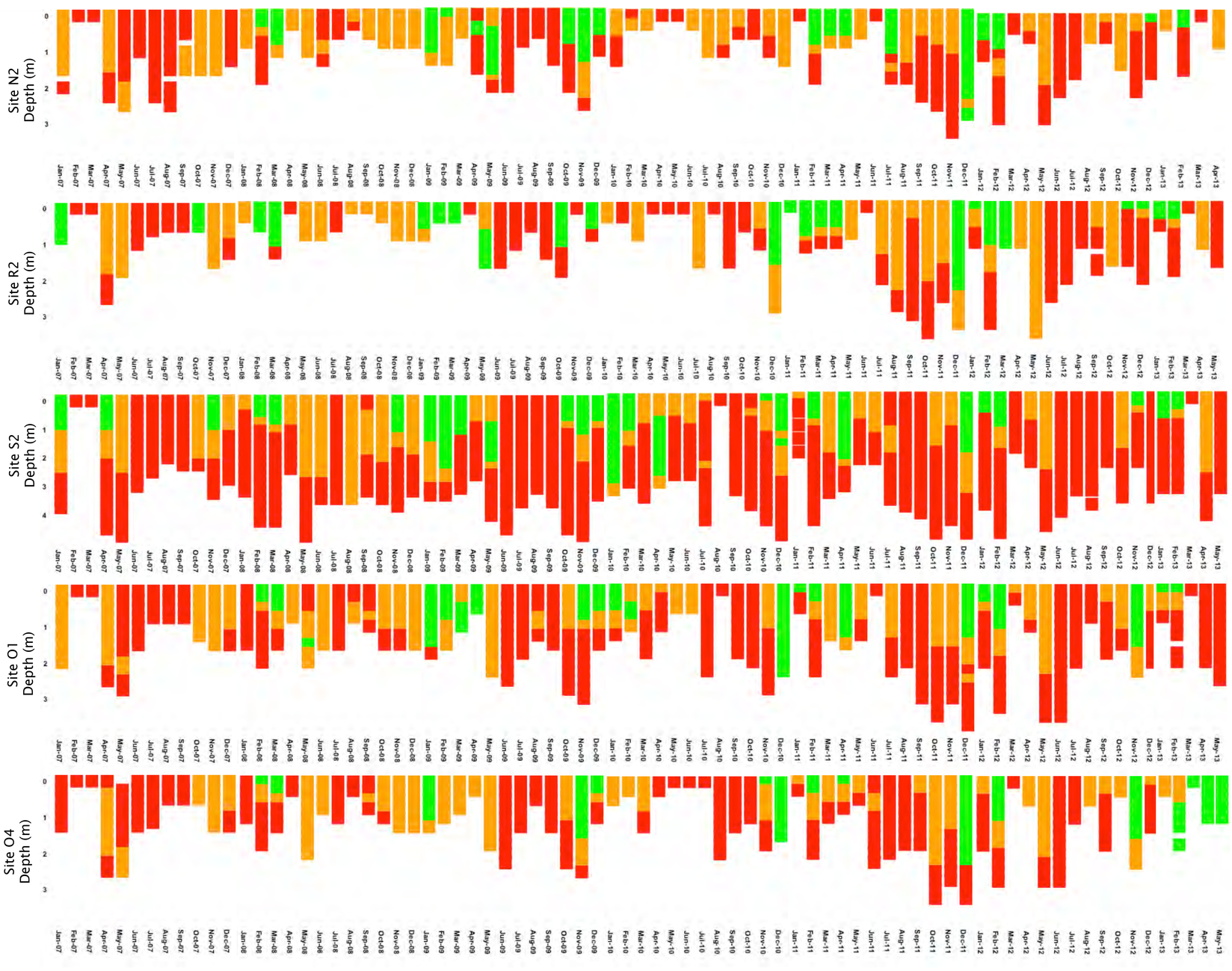
Depth Profiles of Water Quality from January 2007 to May 2013



Good water quality habitat: temperature < 15°C, dissolved oxygen > 7 mgL, salinity < 3 ppt

Fair water quality habitat: temperature < 19°C, dissolved oxygen > 5 mgL, salinity < 10 ppt

Poor water quality habitat: temperature ≥ 19°C, dissolved oxygen ≤ 5 mgL, salinity ≥ 10 ppt

METHODS

Temperature, salinity, and dissolved oxygen water quality parameters in the Carmel River Lagoon were measured in situ. Measurements were taken monthly from a kayak using a YSI Model 85 at 0.25 meter intervals from the surface to substrate at five sites. Using criteria established to represent good water quality habitat (GWQH) for juvenile steelhead trout, data from January 2007 to May 2013 were evaluated.

RECOMMENDATIONS

The GWQH parameters needed to support successful steelhead growth and smoltification in the CRL are most sensitive to two things: availability of fresh water flows from upstream and artificial breaching of the lagoon resulting in abrupt changes to water depths and salinity. An increase in freshwater flows to the lagoon during drier months and cessation of artificial breaching of the lagoon mouth during the wet, winter months would likely help to increase the percentage of GWQH for steelhead rearing in the Carmel River Lagoon.

RESULTS

Sites N2 and R2, near the mouth of the lagoon, had GWQH 22.1% and 20.3%, respectively, during those years. Site S2 in the south arm of the lagoon had GWQH 13.5% of the time. Sites O1 and O4, located in a part of the lagoon that was excavated and restored in 2004, had GWQH 14.8% and 12.5%, respectively, during the six and a half year period evaluated.

Threatened species of the Carmel River Lagoon

Steelhead trout
(Oncorhynchus mykiss)
Listed as threatened by the U.S. Fish and Wildlife Service. The trout have declined in their native ranges due to over-harvest, habitat loss, disease, invasive species, pollution and hybridization with other subspecies.

Western pond turtles
(*Clemmys marmorata)*
Western pond turtles are currently only recognized as a species of special concern by the California Dept. of Fish and Wildlife. These turtles have disappeared from British Columbia, are listed as endangered in Washington, and as sensitive with critical standing in Oregon.

California red-legged frog
(Rana aurora draytonni)
This frog is listed as threatened and is protected by federal and California law. The main causes of its decline are habitat loss and destruction, and the introduction of predatory species.